CLAIMS

1. A two-component developer comprising a carrier and a toner containing a binder resin, a colorant, a wax, and an additive,

wherein the carrier comprises a core material whose surface is coated with a resin composition containing an aminosilane coupling agent and a fluorine-modified silicone resin, and

the wax contained in the toner is at least one wax selected from the following A to D:

A) a synthetic wax with a DSC endothermic peak temperature of 80 to 120°C and an acid value of 5 to 80 mgKOH/g, obtained by reacting at least a C_4 to C_{30} long chain alkyl alcohol, an unsaturated polycarboxylic acid or anhydride thereof, and an unsaturated hydrocarbon wax;

B) an ester wax with a DSC endothermic peak temperature of 50 to 120°C, an iodine value of 25 or less, and a saponification value of 30 to 300;

C) at least one fatty acid amide wax selected from among C_{16} to C_{24} aliphatic amide waxes and alkylene bis fatty acid amides of saturated, monounsaturated, or diunsaturated fatty acids; and

D) at least one type of fatty acid ester wax selected from among hydroxystearic acid derivatives, glycerol fatty acid esters, glycol fatty acid esters, and sorbitan fatty acid esters.

2. The two-component developer according to Claim 1, wherein the toner is produced by the external addition of at least an inorganic micropowder whose average particle size is from 6 to 120 nm in an amount of 1.0 to 5.5 parts by weight per 100 parts by weight of a toner matrix containing the synthetic wax of A above.

3. The two-component developer according to Claim 2, wherein, in the molecular weight distribution of the synthetic wax by gel permeation chromatography (GPC), the weight average molecular weight is from 1000 to 6000, the Z average molecular weight is from 1500 to 9000, the ratio of weight average molecular weight to number average molecular weight (weight average molecular weight/number average molecular weight) is from 1.1 to 3.8, the ratio of the Z average molecular

weight to the number average molecular weight (Z average molecular weight/number average molecular weight) is from 1.5 to 6.5, and there is at least one molecular weight maximum peak in the region from 1×10^3 to 3×10^4.

4. The two-component developer according to Claim 1, wherein the toner is produced by the external addition of at least an inorganic micropowder whose average particle size is from 6 to 120 nm in an amount of 1.0 to 5.5 parts by weight per 100 parts by weight of a toner matrix containing the ester wax of B above.

5. The two-component developer according to Claim 4, wherein, in the molecular weight distribution of the ester wax by gel permeation chromatography (GPC), the number average molecular weight is from 100 to 5000, the weight average molecular weight is from 200 to 10,000, the ratio of weight average molecular weight to number average molecular weight (weight average molecular weight/number average molecular weight) is from 1.01 to 8, the ratio of the Z average molecular weight to the number average molecular weight (Z average molecular weight/number average molecular weight) is from 1.02 to 10, there is at least one molecular weight maximum peak in the region from 5×10^2 to 1×10^4, and the weight loss on heating at 220°C is no more than 8 wt%.

6. The two-component developer according to Claim 1, wherein the toner is produced by the external addition of at least an inorganic micropowder whose average particle size is from 6 to 120 nm in an amount of 1.0 to 5.5 parts by weight per 100 parts by weight of a toner matrix containing the fatty acid amide wax of C above.

7. The two-component developer according to Claim 1, wherein the toner is produced by the external addition of at least an inorganic micropowder whose average particle size is from 6 to 120 nm in an amount of 1.0 to 5.5 parts by weight per 100 parts by weight of a toner matrix containing the fatty acid ester wax of D above.

8. The two-component developer according to Claim 1,

wherein the toner is produced by the external addition of:

an inorganic micropowder whose average particle size is from 6 to 20 nm and whose ignition loss is from 0.5 to 25 wt% in an amount of 0.5 to 2 parts by weight per 100 parts by weight of a toner matrix, and

an inorganic micropowder whose average particle size is from 30 to 120 nm and whose ignition loss is from 0.1 to 23 wt% in an amount of 0.5 to 3.5 parts by weight per 100 parts by weight of a toner matrix.

9. The two-component developer according to Claim 1, wherein the toner is produced by the external addition of a negatively-chargeable inorganic micropowder whose average particle size is from 6 to 120 nm and whose ignition loss is from 0.5 to 25 wt% in an amount of 0.8 to 4 parts by weight per 100 parts by weight of a toner matrix,

and of a positively-chargeable inorganic micropowder whose average particle size is from 6 to 120 nm and whose ignition loss is from 0.5 to 25 wt% in an amount of 0.2 to 1.5 parts by weight per 100 parts by weight of a toner matrix.

10. The two-component developer according to Claim 1, wherein the toner is produced by the external addition of:

a negatively-chargeable inorganic micropowder whose average particle size is from 6 to 20 nm and whose ignition loss is from 0.5 to 25 wt% in an amount of 0.6 to 2 parts by weight per 100 parts by weight of toner matrix particles,

a negatively-chargeable inorganic micropowder whose average particle size is from 30 to 120 nm and whose ignition loss is from 0.1 to 23 wt% in an amount of 0.2 to 2.0 parts by weight per 100 parts by weight of toner matrix particles, and

a positively-chargeable inorganic micropowder whose average particle size is from 6 to 20 nm and whose ignition loss is from 0.5 to 25 wt% in an amount of 0.2 to 1.5 parts by weight per 100 parts by weight of toner matrix particles.

11. The two-component developer according to Claim 1, wherein the resin coating the carrier contains 5 to 40 parts by weight of an aminosilane coupling agent per 100 parts by weight coating resin.

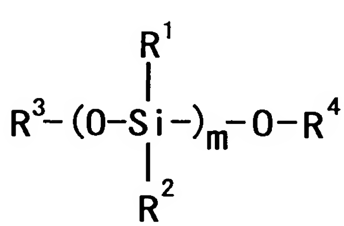
12. The two-component developer according to Claim 1, wherein the blend proportion of the toner and carrier is such that the toner accounts for at least 2 wt% and no more than 10 wt%, and the carrier for at least 90 wt% and no more than 98 wt%.

13. The two-component developer according to Claim 1, wherein the additive is added in a proportion of at least 1.5 wt% and no more than 6 wt% per 100 parts by weight of toner.

14. The two-component developer according to Claim 1, wherein the fluorine-modified silicone resin is a crosslinkable fluorine-modified silicone resin obtained by reacting a perfluoroalkyl group-containing organosilicon compound with a polyorganosiloxane.

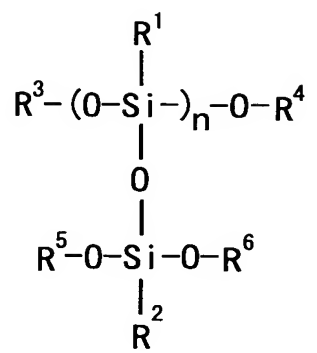
15. The two-component developer according to Claim 14, wherein the perfluoroalkyl group-containing organosilicon compound is at least one compound selected from among $CF_3CH_2CH_2Si(OCH_3)_3$, $C_4F_9CH_2CH_2Si(CH_3)(OCH_3)_2$, $C_8F_{17}CH_2CH_2Si(OCH_3)_3$, $C_8F_{17}CH_2CH_2Si(OC_2H_5)_3$, and $(CH_3)_2CF(CF_2)_8CH_2CH_2Si(OCH_3)_3$.

16. The two-component developer according to Claim 14, wherein the polyorganosiloxane is at least one type selected from among Chemical Formulas 1 and 2 below:



(Chemical Formula 1)

(where R^1 and R^2 are each a hydrogen atom, halogen atom, hydroxy group, methoxy group, or C_1 to C_4 alkyl group or phenyl group, R^3 and R^4 are each a C_1 to C_4 alkyl group or phenyl group, and m is a positive integer indicating the average degree of polymerization)



(Chemical Formula 2)

(where R^1 and R^2 are each a hydrogen atom, halogen atom, hydroxy group, methoxy group, or C_1 to C_4 alkyl group or phenyl group, R^3, R^4, R^5, and R^6 are each a C_1 to C_4 alkyl group or phenyl group, and n is a positive integer indicating the average degree of polymerization).

17. The two-component developer according to Claim 14, wherein the fluorine-modified silicone resin is a crosslinkable fluorine-modified silicone resin obtained by reacting a perfluoroalkyl group-containing organosilicon compound in an amount of at least 3 parts by weight and no more than 20 parts by weight with 100 parts by weight of a polyorganosiloxane.

18. The two-component developer according to Claim 1, wherein the aminosilane coupling agent is at least one type selected from among γ-(2-aminoethyl)aminopropyltrimethoxysilane, γ-(2-aminoethyl)aminopropylmethyldimethoxysilane, and octadecylmethyl[3-(trimethoxysilyl)propyl] ammonium chloride.

19. An image formation method, comprising a developing apparatus in which an AC bias with a frequency of 1 to 10 kHz and a bias of 1.0 to 2.5 kV (p-p) is applied along with a DC bias between a photosensitive member and a developing roller, and the peripheral speed ratio between the photosensitive member and the developing roller is from 1:1.2 to 1:2,

said method involving the use of a two-component developer

comprising a carrier and a toner containing a binder resin, a colorant, a wax, and an additive, the carrier comprising a core material whose surface is coated with a resin composition containing an aminosilane coupling agent and a fluorine-modified silicone resin, and the wax contained in the toner being at least one wax selected from the following A to D:

A) a synthetic wax with a DSC endothermic peak temperature of 80 to 120°C and an acid value of 5 to 80 mgKOH/g, obtained by reacting at least a C_4 to C_{30} long chain alkyl alcohol, an unsaturated polycarboxylic acid or anhydride thereof, and an unsaturated hydrocarbon wax;

B) an ester wax with a DSC endothermic peak temperature of 50 to 120°C, an iodine value of 25 or less, and a saponification value of 30 to 300;

C) at least one fatty acid amide wax selected from among C_{16} to C_{24} aliphatic amide waxes and alkylene bis fatty acid amides of saturated, monounsaturated, or diunsaturated fatty acids; and

D) at least one type of fatty acid ester wax selected from among hydroxystearic acid derivatives, glycerol fatty acid esters, glycol fatty acid esters, and sorbitan fatty acid esters.

20. An image formation method, comprising a transfer system in which there are a plurality of toner image forming stations including at least an image support, charging means for forming an electrostatic latent image on the image support, and a toner support, the electrostatic latent image formed on the image support is visualized using a two-component developer comprising a carrier and a toner containing a binder resin, a colorant, a wax, and an additive,

the carrier comprising a core material whose surface is coated with a resin composition containing an aminosilane coupling agent and a fluorine-modified silicone resin, and

the wax contained in the toner being at least one wax selected from the following A to D:

A) a synthetic wax with a DSC endothermic peak temperature of 80 to 120°C and an acid value of 5 to 80 mgKOH/g, obtained by reacting at least a C_4 to C_{30} long chain alkyl alcohol, an unsaturated polycarboxylic acid or anhydride thereof, and an unsaturated

hydrocarbon wax;

B) an ester wax with a DSC endothermic peak temperature of 50 to 120°C, an iodine value of 25 or less, and a saponification value of 30 to 300;

C) at least one fatty acid amide wax selected from among C_{16} to C_{24} aliphatic amide waxes and alkylene bis fatty acid amides of saturated, monounsaturated, or diunsaturated fatty acids; and

D) at least one type of fatty acid ester wax selected from among hydroxystearic acid derivatives, glycerol fatty acid esters, glycol fatty acid esters, and sorbitan fatty acid esters,

a primary transfer process, in which the toner image produced by the visualization of the electrostatic latent image is transferred to an endless transfer member by bringing the transfer member into contact with the image support, is sequentially and continuously executed to form a multilayer transferred toner image on the transfer member, and then a secondary transfer process, in which the multilayer toner image formed on the transfer member is transferred all at once to a transfer medium, is executed, and the transfer processes form an image under a condition of $d1/v \leq 0.65$ (sec), when d1 (mm) is a distance from a first primary transfer position to a second primary transfer position, or a distance from the second primary transfer position to a third primary transfer position, or a distance from the third primary transfer position to a fourth primary transfer position, and v (mm/s) is the peripheral speed of the photosensitive member.

21. An image formation method, comprising a transfer system in which there are a plurality of toner image forming stations consisting of at least an image support, charging means for forming an electrostatic latent image on the image support, and a toner support, the electrostatic latent image formed on the image support is visualized using a two-component developer comprising a carrier and a toner containing a binder resin, a colorant, a wax, and an additive,

the carrier comprising a core material whose surface is coated with a resin composition containing an aminosilane coupling agent and a fluorine-modified silicone resin, and

the wax contained in the toner being at least one wax selected from the following A to D:

A) a synthetic wax with a DSC endothermic peak temperature of 80 to 120°C and an acid value of 5 to 80 mgKOH/g, obtained by reacting at least a C_4 to C_{30} long chain alkyl alcohol, an unsaturated polycarboxylic acid or anhydride thereof, and an unsaturated hydrocarbon wax;

B) an ester wax with a DSC endothermic peak temperature of 50 to 120°C, an iodine value of 25 or less, and a saponification value of 30 to 300;

C) at least one fatty acid amide wax selected from among C_{16} to C_{24} aliphatic amide waxes and alkylene bis fatty acid amides of saturated, monounsaturated, or diunsaturated fatty acids; and

D) at least one type of fatty acid ester wax selected from among hydroxystearic acid derivatives, glycerol fatty acid esters, glycol fatty acid esters, and sorbitan fatty acid esters,

a transfer process is executed in which the toner image produced by the visualization of the electrostatic latent image is transferred sequentially and continuously to a transfer medium, and the transfer process forms an image under a condition of $d1/v \leq 0.65$ (sec), when d1 (mm) is a distance from a first primary transfer position to a second primary transfer position, or a distance from the second primary transfer position to a third primary transfer position, or a distance from the third primary transfer position to a fourth primary transfer position, and v (mm/s) is the peripheral speed of the photosensitive member.